

Claims

1. An acoustic structure capable of hands-free speaker function and protected against dust and water according to the IP 67 standard, comprising, in a device body, two interconnected, separate cavities for speaker means and isolating means, where an isolating diaphragm, belonging to the isolation means, is arranged to simultaneously function as an isolating means for dust and water and as a sound-reproduction element.
2. The acoustic structure according to claim 1 wherein a first cavity intended for the speaker means and a second cavity intended for the isolating means are located substantially parallel in the device body, whereby the cavities are interconnected through a first acoustic path, and in which speaker arrangement an open second acoustic path leads, from the second cavity intended for the isolating means, out of the device.
3. The acoustic structure according to claim 2 wherein the mechanical dimensions of the first cavity and second cavity are independent of each other to achieve good isolation against dust and water.
4. The acoustic structure according to claim 2 wherein the second cavity is basically cylindrical in form and has a substantially circular shoulder to divide said second cavity into two sub-cavities, a first sub-cavity and a second sub-cavity, onto which shoulder an isolating diaphragm is to be attached to provide dustproof and waterproof sealing between outside environment and speaker means.
5. The acoustic structure according to claim 4 wherein on top of the isolating diaphragm on said shoulder in the second sub-cavity there is additionally placed a substantially circular attachment disc which has an aperture in it to direct a sound wave produced by the speaker means and conducted via the first acoustic path into the second cavity and there in the first sub-cavity, towards the isolating diaphragm.
6. The acoustic structure according to claim 5 wherein at least the perimeter area of that surface of the isolating diaphragm which faces the attachment disc is treated with glue in order to attach the isolating diaphragm to the attachment disc in a waterproof manner.
7. The acoustic structure according to claim 6 wherein at least the perimeter area of the other surface of the isolating diaphragm is also treated with glue in order to attach the isolating diaphragm to the shoulder in a waterproof manner.

8. The acoustic structure according to claim 5 wherein on that side of said attachment disc, which is not facing the isolating diaphragm, an audio channel is provided the width of which substantially at least equals the diameter of the aperture in the attachment disc, and which audio channel extends at least to said aperture.
- 5 9. The acoustic structure according to claim 8 wherein the attachment disc further comprises a lug arranged so as to be inserted in an alignment hollow in the second cavity in order to make the audio channel substantially parallel to the first acoustic path.
- 10 10. The acoustic structure according to claim 8 wherein the side of said attachment disc facing the isolating diaphragm is made concave to enable the isolating diaphragm to move in both directions about its rest position, and which movement is arranged so as to occur in accordance with the variations of acoustic pressure coming from the speaker means into the first sub-cavity.
- 15 11. The acoustic structure according to claim 10 wherein the movement of the isolating diaphragm is arranged so as to cause variation of acoustic pressure in the second sub-cavity from where said variations of acoustic pressure are arranged to be conducted outside the device via the second acoustic path.
- 20 12. The acoustic structure according to claim 9 which further comprises a sealing part against the device body and attachment disc, and a cover part against said sealing part, which are arranged so as to press the isolating diaphragm, supported on the attachment disc, against the shoulder in order to close up the second cavity in a dustproof and waterproof manner.
- 25 13. The acoustic structure according to claim 2 wherein the first cavity has a basic shape of a cylinder and it includes a substantially circular shoulder to divide said first cavity into two parts, and onto which shoulder a sealing ring is to be installed and on top of that, a speaker element to separate the air volumes in front of the speaker and behind the speaker from one another.
- 30 14. The acoustic structure according to claim 13 wherein said shoulder is located in the first cavity in such a manner that it creates a free air space suitable for sound reproduction between the speaker element and the bottom of the first cavity, and that a first acoustic path opens up from this free air space, leading to the second cavity reserved for isolating means.

15. The acoustic structure according to claim 13 which further comprises a damper and sealing plate to support the speaker element onto the device body.
16. The acoustic structure according to claim 15 wherein said damper is arranged so as to have effect on the acoustic characteristics of the acoustic structure.
- 5 17. the acoustic structure according to claim 1 wherein said device is one of the following: a cellular network terminal, intercom phone, robot phone, portable audio device or a radio receiver.